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ABSTRACT

The history of playground safety standards since the 1890s is reviewed and the lack of improvements in safety made since that time is demonstrated. The first formal effort to develop standards for playground apparatus was made by the National Recreation Association (NRA) in 1929. A major concern in this and a 1938 NRA report was the choice of safe surface materials for playgrounds. However, the 1938 report indicated no progress in knowledge of the subject. By 1940 concerns over liability for playground injuries had prompted the publication of recommendations to playground workers aimed at reducing injuries and liability. In the 1940s, '50s, and '60s, asphalt and concrete surfaces and heavy, hazardous equipment proliferated with the support of school administrators. A 1978 study by the National Electronic Injury Survey System indicated that 59% of playground injuries result from falls to hard surfaces. Various professional and citizens groups have begun to call for increased safety standards and regulation. Playground and play equipment designers, manufacturers, and consumers have reacted slowly to these calls. Despite advances in knowledge, most playgrounds remain hazardous and unsuited to children's developmental play needs. What are probably the most extensive and thoughtful safety guidelines to date were published in 1981 by the Consumer Product Safety Commission. They are summarized in this article. (A list of 38 references is appended.) (BN)

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HISTORY OF PLAYGROUND SAFETY IN AMERICA

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Since the initial period of rapid playground development in American cities, during the last decade of the 1800's, the issue of playground safety has been a subject of concern. Initially, a primary concern was that children be removed from the temptations and hazards of playing in the streets, but it was soon found that the new playgrounds themselves contained inherent dangers.

EARLY PLAYGROUNDS

The first playgrounds for very young children were sand play areas inspired by the sand gardens of Germany. Gymnasium equipment transported to the out-of-doors comprised the earliest playgrounds for older children. Mero (1980) illustrated servicable equipment in use on playgrounds in various American cities in the early 1900's. For example, the approved equipment for children under six were sand bins with awnings for shade, sand buckets and shovels, bean bags and low benches. The equipment for children six to twelve years included giant strides, horizontal ladders (adjustable from 4 ft. 6 in. to 6 ft.), swings with four seats each (9 ft. high), tether poles and teeter boards. More comprehensive playgrounds included basketballs, baseballs and jumping ropes. For municipal playgrounds shelter houses with toilets, storerooms, shower baths, fencing and shrubbery, baseball diamonds and tennis courts were prescribed.

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During this same period, slides and merry-go-rounds were becoming common on playgrounds. The merry-go-round was invented by Tehurdore Worth, formerly Superintendent of Parks in Hartford, Connecticut. Mero described it "...at once the most expensive simple piece of apparatus and the greatest economizer of space." It could be operated in twenty square feet of space by as many as eighty children at a time!

Judging from drawings, photographs and written descriptions of equipment of this era, some of the major hazards were excessive heights (swings and trapeze bars 15 to 20 feet high, slides 10 to 15 feet high), merry-go-rounds with openings in the base to allow children to run inside the apparatus, swinging metal rings at body (head) level, crowded conditions (several hundred children at once), and hard surfacing under equipment. It is to their credit that early playground pioneers stressed high quality play leadership and supervision.

Even in this early period, a great deal of attention was given to surfacing. Mero suggested mixing equal parts of screened cinders and clay, spread one inch thick over coarse cinders and rolled to make an all weather surface for the overall playground, excluding areas under equipment. He recommended that fine soft sand be spread a foot deep under the gymnasium, parallel bars, turning poles, see-saw and jumping places. He prescribed hard surfaces under giant strides and swings to prevent holes from wearing in the surface. "A strip of cement side-walk about three feet wide under the swings works like a charm. . . About the best thing for the giant stride is a bed of screened cinders mixed with clay spread eight inches deep and packed solid (p.82)."

Mero gave specific guidelines for the construction of equipment to ensure durability and safety. He suggested swing frames should be strong and

secured by attaching them to planks buried one foot underground, and see-saw boards should be fastened securely to saw horses so they cannot slip off or turn to the side and hit others.

Further elaboration was made by Arthur Leland in Mero's book (pp.79-90). He believed the following points should be considered in judging playground apparatus: (1) is it safe? Will it run by itself or will it need supervision? The teeter ladder and the flying Dutchman were judged without elaboration as "interesting but somewhat unsafe." (2) will it be interesting after the novelty wears off? Apparatus involving falling, swinging or gliding "... take the place of foreign travel to the city child, and are intrinsically interesting." (3) is the equipment simple, inexpensive, durable? From an administrative standpoint, the less adjustability and maintenance, the better. Wood and rope should be replaced by galvanized metal.

Leland gave detailed instruction for the construction of equipment. For example, equipment frames should be made of three inch wrought iron pipe and set in concrete. Swing uprights should be 13 feet long. See-saw boards are made of good solid oak, 2 in. by 10 in. by 14 ft. long. Giant stride uprights are 4 1/2 in. by 18 ft. To keep little tots from danger, he substituted swing seats made of two pieces of sole leather riveted together for the typical hardwood seats, perhaps America's first soft, flexible swing seats. Swings (gliders) made of wood, in which several persons sit opposite one another, were not recommended because of "the danger of accident".

By 1917, playground specialists were recognizing the miserable state of American playgrounds. Curtis (1917) called the playgrounds of many of our cities "a disgrace to the systems to which they belong (p. 121)." He believed that less than half were in useable condition -- covered with brickbats, piles of ashes, and gullied by rain. He offered a common modern day criticism, "The school trustees apparently finish the building and forget all about the

playground." He lamented the fact that so many schools paved their playgrounds with brick: "I suppose that this surfacing must have been chosen by the janitor." An ideal surface would be smooth, dry, springy, cool in the sun, non-slippery in the rain, and would not shock or bruise the children. "Probably we shall have to manufacture a surface for the playground as we do for the street before we get one that is entirely satisfactory."

EARLY PLAYGROUND STANDARDS

The first formal effort to develop standards for playground apparatus was apparently made by the Committee on Standards in Playground Apparatus, commissioned by the National Recreation Association (NRA.). Seventeen recreation executives from ten States prepared a statement (NRA, 1929; 1931) which they considered to be a guide to communities in selecting playground apparatus. Essential elements for playground success were to:

1. Consider location, arrangement and erection, regular inspection, supervision, designated apparatus zones, care of ground under apparatus, and instruction for use of equipment.

2. Specify preschool apparatus for the exclusive use of younger children.

3. Provide separate elementary age playgrounds for boys and girls (some believed that boys and girls could play together).

Minimum standards recommended by the Committee were:

Preschool	Chair swings (6)
Children	Sand box (2 sections)

	Small slide
	Low climbing device
Elementary School Age	Swings (6, 12 ft. high)
	Slide (8 ft. high, 16 ft. long)
	Horizontal ladder
	Traveling rings or giant stride
	Balance beam
	See-saws (3-4)

The Committee decided it was better to provide separate pieces of apparatus rather than the multifaceted gymnasium frame then popular on many playgrounds. Flying rings and trapeze mounted on the gymnasium frame were considered too dangerous and slides attached to the frame were too high. Whirling or revolving devices (e.g., merry-go-rounds) were judged to be of less value than the apparatus recommended and presented a greater hazard due to power generated in its use and the large number of children accommodated at one time. It was agreed that such apparatus could be installed only if it was properly constructed and supervised.

Although not generally considered as playground apparatus, the Committee also recommended equipment for basketball, volleyball, baseball, jacks, bean bags, horseshoes, building blocks and handcraft. They recommended playgrounds contain a shelter with toilet facilities, drinking fountains, grass plots and shrubs, gardens, and fencing. Sand boxes and handcraft areas should be shaded by trees or awnings. Benches should be available for mothers who come to the playground with small children. The surface of the playground should be even and smooth, hard enough to prevent footprint holes, yet soft enough to prevent injury by falls. Grass was

considered to be the most desirable surface but not practical in high use areas. The recommended surface was a subsurface of rolled cinders covered with loam, limestone screenings, or torpedo sand. Grass was recommended for major games and sports areas, and a year-round surface, preferably bituminous, for a year-round play section of the playground.

GUIDELINES FOR SURFACING: THE 1930's

In response to a request by recreation authorites the National Recreation Association (1932) appointed a committee of eleven recreation authorities from the United States to conduct a study of problems involved in surfacing children's playground areas. Information was collected on three areas: (1) surfacing materials, (2) methods of constructing and maintaining surfaces, and (3) cost involved. Their two part report was published in the August, 1932, and September, 1932 issues of Recreation (formerly The Playground). Although the methodology of the study was not discussed in the final report, data on surfacing practices were reported from more than twenty major cities with extensive playground experience. The Committees inquiries and conclusions dealt with both playgrounds and specially surfaced courts used for games such as tennis and handball, with the dominant emphasis on the special games courts.

In general, the recommended desirable qualities of a play surface were resilience, good drainage, dust free, durability, nonabrasiveness, cleanliness, firmness, smoothness, utility, reasonable cost, and good appearance. The Committee found a wide range of surfaces in use around the country: grass turf, sand-clay mixture, clay-torpedo grave-sand mixture, loam, agricultural slag, sand-clay-loam, crushed stone, limestone screenings, rock screenings, bituminous surfaces (various asphalt mixes), and concrete. Most

of the surfaces were of combination materials and rolled to promote a smooth, even surface.

Recreation officials from the South Parks playgrounds in Chicago commented on their experience with surfacing. They found that cinders were too sharp, easily crushed into dust and dangerous to the eyes. Crushed limestone, packed too solidly, created a dust problem and was "glaring in color." Torpedo gravel, or granite screenings, one stone deep over heavy black loam, was unsatisfactory. The loam cut through the gravel creating a dusty, loose surface. The surface was treated with light, road oil in an effort to control the dust, but a grimy condition ensued, blackening children and floors of buildings. Cork brick heaved in the winter; granulated slag hardened; and both were discontinued. After twenty-five years of experience the Chicago officials found a "satisfactory surface" consisting of four inches of yellow clay with a 3/16" topping of torpedo gravel and sand, rolled and compacted. Calcium chloride crystals were sprinkled over the surface to absorb moisture and eliminate dust.

Most recreation leaders agreed that concrete was not a satisfactory surface for general play because it lacked resiliency and was likely to "prove harmful to the feet of children." Most preferred asphalt surfaces since they were more resilient than concrete and easy to maintain.

The extensive report contained a brief section on surfacing under equipment. Special surfacing under and around such equipment as the horizontal bar, trapeze, flying rings, horizontal ladders, and at the foot of slides was recommended in order to avoid or reduce injury in the case of falls. The materials recommended were tanbark, sawdust, shavings and sand. These materials were to be used alone or in combination and should be spaded and raked frequently. It was judged advisable to excavate the area a few inches and set planks on edge to contain the surfacing material.

The Committee appears to have made two significant oversights. One, they over-emphasized the desirable qualities of bituminous surfaces and, two, they excluded certain equipment for recommendation for special resilient surfaces. They stated that regular playground surface (e.g., asphalt) is laid around such equipment as the see-saw, giant stride and traveling rings since holes are worn in softer surfaces, which required frequent maintenance. Although they did not approve concrete under swings, they reported several "successful" methods of surfacing including creosoted planks, gravel and bituminous surfaces.

The recommendations of the NRA's Committee on Playground Surfacing set the standard for later playground designers and specialists. Six years after publication of the Committee's report, the NRA published The New Play Areas: Their Design and Equipment (Butler, 1938). The recommendations on surfacing were virtually identical to those of the Commission, indicating no measurable progress or change in attitudes or knowledge of the subject. Further, the minimum standards recommended for playground equipment by Butler in 1938 were identical to those made by the NRA's Committee on Standards in Playground Apparatus in 1931.

EARLY CONCERNS FOR LIABILITY

The playground developers of this early era were not swayed by the threat of lawsuits as they are today. Yet, as early as 1915, parents of a young boy sued the school board of Tacoma, Washington over an injury their son received in a fall from a swing. The verdict required the school board to pay damages for the injury and resulted in the removal of play equipment from many schools in the state of Washington (Curtis, 1917). Periodically over the years, similar patterns of injury/play equipment removal have been

recorded in various areas of the United States.

By 1940, the subject of liability for recreation area injuries (including playgrounds), was of such interest that an address to California recreation workers titled, Safety Versus Lawsuits, was published in Recreation (Jacobson, 1940). Based upon his knowledge of law and of numerous lawsuits during the 1930's, Jacobson made specific recommendations for safety aimed at reducing injuries and liability:

1. Purchase the best equipment obtainable and keep it in good condition.
2. Observe equipment in actual use. If defects are found, correct them. "You will find it impossible to convince a court or jury that a playground device is safe when injuries are proven to have occurred frequently upon it (p.88)."
3. Develop a system of inspection, including prompt repair or dismantling of defective equipment.
4. Inspections should be according to a set schedule, some devices weekly, some monthly.
5. A printed inspection and repair form should be used for each piece of equipment specifying the inspection rules.
6. Records should be kept of all repairs with the nature of the work, dates, and names of the inspector, and the person making the repairs noted.
7. Playgrounds should be carefully supervised by trained personnel.
8. Signs addressed to parents and guardians should warn specifically of any unsafe conditions in recreation areas (water hazards in park areas, etc.). Signs such as "Not Responsible for Accidents" are absurd. One cannot escape one's legal responsibility by a sign saying, in effect, that one chooses not to be obligated.

PLAYGROUND SURFACING; THE 1940's AND 1950's

The popularity and heavy use of playgrounds during the 1930's and 1940's inevitably led to extensive areas becoming hard packed with protruding rocks and "dust bowls". Entire school systems turned to asphalt as a substitute. (Grass turf, though considered the best general surface by many, was very difficult to retain in high use areas). Administrators and teachers appear to have been so eager to escape the dust bowl conditions of previous playgrounds that they heartily endorsed asphalt as the "ideal" play surface. In a California survey (Scott, 1942) when asked: "Do you, in general, like or dislike the hard surfacing (asphalt) for playgrounds?," the response was: Like, 97; Dislike, 3; Uncertain, 3. They also endorsed asphalt as making it possible for greater use of playgrounds and as causing fewer accidents than before. It appears that no distinction was made in the survey for general play areas and areas under and around quipment. The dearth of careful, extensive studies of equipment and surface related accidents/injuries appear to have allowed almost universal acceptance of asphalt as a general playground surface without due regard for surfaces under equipment.

One of the predictable consequences of this attitude was the later belief that ordinary equipment, such as swings and slides, were dangerous, inadequate and breakable. Not realizing that surfaces and sloppy maintenance were probably greater contributors to accidents than equipment per se, designers introduced the concrete sculpture era. (Recreation, 1949; Hostvet, 1950; Recreation, 1954). This period was reputed for its intense interest in sewer pipes and concrete sculptures: the "whatnot", a set of concrete steps leading nowhere; the "dodger," a series of low concrete block walls arranged in maze-like fashion; the "rocket ship", made of concrete sewer pipes; the "concrete turtle"; and the concrete log," imbedded in concrete and raised off

the ground for playing "Hi-Yo Silver". We were now seeing total disregard for (indeed, oblivion to) earlier concerns about hard surfaces on playgrounds. Concrete and asphalt, the pride of maintenance personnel and administrators, has carried the day over concerns safety, creativity, and challenge. We are still fighting this legacy today.

Fortunately, not everyone during the 1950's subscribed to this "concrete affinity". In Europe the development of "junk playgrounds" later called adventure playgrounds, began to influence Americans. Commercial firms, spurred by the profit motive, were experimenting with safer playground surfaces. The Firestone Tire and Rubber Company (Moore, 1951) developed a rubber powder playground surface material for installation on asphalt or concrete while the Goodyear Tire and Rubber Company (Polson, 1951) developed pelletized rubber. It is unlikely that such materials, applied to a thickness of three/eight of an inch, would provide acceptable protection in falls from equipment. However, they did set the stage for more effective, manufactured surfaces, later on.

Predictably, the consequences of using hard surfaces under playground equipment was brought to public attention (Recreation, 1951). Injuries and fatalities on the school playgrounds of Los Angeles (Bradshear, 1952; Zaun, 1955; Zaun, 1952) led to public protest against the use of blacktop surfaces for elementary play areas. This criticism included a prediction that the school board would be indicted for involuntary manslaughter. By 1948-49, one hundred ninety elementary schools (60% of the total in the district) had been resurfaced with blacktop. Recommendations to the board of education were varied: inactivate all playground apparatus; remove all blacktop surfaces; and remove all playground apparatus.

Two studies were conducted; one resulted in a report by the school superintendent and a report by the Citizens' Advisory Committee on

Playground Surfaces. The superintendent's report noted that of all fifty American cities with populations over 200,000, 27 had blacktop surfaces under or around all, or a substantial portion of playground apparatus. Ten of these cities had no playground apparatus. Nine of the cities had covering other than blacktop, in four cases this was some form of hard surface. It is particularly revealing that no more than 5 out of 50 American cities had any form of resilient surface under or around equipment. There were no data to indicate the nature of the surfaces. Of 29 California school systems studied, only one (Long Beach) consistently used sand under equipment. The superintendent's report generally supported the use of blacktop and school principals overwhelmingly supported its use under equipment. The report concluded the major problem is not the type of surfacing but one of pupil instruction on use of equipment and adequate supervision. . . "teachers and supervisiors and principals have found that blacktop hard surfacing actually promotes safety (p. 326)."

In contrast, the Citizens Advisory Committee Report concluded that playground apparatus activites are an integral part of the program and should be continued: shock absorbing material should be placed under apparatus; supervision and instruction are essential; and studies are needed on the absorptive qualities (resiliency) of surfacing materials. Their additional conclusion that injuries in falls result from the manner in which the body strikes the surface, and not necessarily by the type of surface, may have influenced the outcome of a lawsuit against the city of Los Angeles involving the deaths of two children after falls on hard surfaced areas. The city won the court case, with evidence that "how you land is more significant than what you fall on, in determining the severity of injury. . . (Recreation, 1952)."

These Los Angeles centered events stimulated schools, at least in California, to initiate experimentation with surfacing under apparatus. The

Los Angeles school district installed rubber surfacing under equipment in 1955 (Butwinick, 1974) and the Pasadena school system installed eight inches of sand under equipment, retained by prefabricated concrete curbs with rounded edges (Recreation, 1952).

MOVEMENTS TO MODERNIZE EQUIPMENT

During the 1950's and 1960's, an increasing number of playgrounds continued to reflect the imagination of adult designers and their concern for creativity in play. Earlier concrete sculptures were supplemented by boats to free landlocked children to "go down to the sea in ships", and horses, (some mounted as swings) to appeal to the "cowboys and Indians of the 'horsey' set" (Skea, 1958). Heavy animal seats with projectile-like noses and legs became battering rams, later responsible for many playground injuries. Many commercial firms still offer a wide selection of these hazardous swing seats. Such efforts to modernize playgrounds through provisions for imaginative play were indeed well founded philosophically . Conventional playgrounds provided for essentially one form of play-exercise. The spray pools, trains, igloos, sculptures, boats, stagecoaches, fire engines, and later, rockets and space ships (Recreation, 1959; Birkhead, 1959; Hanson, 1959; Recreation, 1961) were serious efforts to enhance play but frequently resulted in potentially hazardous and uninspiring designs. Since only very limited research was available to guide them, the creations of adults tended to mirror adult conceptions of children's play choices. By the end of the 1960's, various groups concerned with safety were seeing efforts to "modernize" playgrounds had not resulted in an acceptable degree of safety.

RECENT EFFORTS
TO DEVELOP SAFETY STANDARDS

In 1969, the chairman of the Committee on Accident Prevention of the American Academy of Pediatrics met with a group in New York to prepare voluntary standards for playground equipment (correspondence dated September 14, 1972 between the Accident Prevention Laboratory of the University of Iowa and the American Academy of Pediatrics). The purpose of this group was to "establish a nationally recognized safety standard for children's home playground equipment" (The Academy, 1969). Their specifications were relevant to swinging, revolving and rotating equipment and related apparatus. Primary concerns were with proper assembly, installation, location in respect to obstructions, exposed bolts, durability and strength of materials, manufacturer's testing procedures, materials for swing seats and surface finishes. Although the draft of standards was sent out to members for comments, they were not adopted. Legislation was not proposed and the effort was abandoned in 1971.

The early playground developers were hampered in their quest for playground safety by the absence of comprehensive research data. This led to considerable confusion, especially with respect to appropriate surfaces. The overall effect was tacit acceptance for over a half century of asphalt and packed surfaces under and around play equipment. The introduction of the National Electronic Injury Survey System (NEISS) in 1972 was a milestone in playground safety (NEISS, 1982). The system comprises a sample of hospitals (currently 72) that are statistically representative of hospitals with emergency departments in the United States and its territories. The NEISS provides national estimates of the number and severity of injuries treated in hospital emergency rooms associated with but not necessarily caused by consumer products including playground equipment.

The 1978 study by NEISS estimated that in 1977 about 93,000 people were treated in hospital emergency rooms for injuries associated with the use of playground equipment. Eighty per cent of the injuries were suffered by children ten years of age or younger. A special study by NEISS in 1978 identified falls onto hard surfaces as the major incriminating factor in playground injuries (Table 1).

Table I

Estimated injuries and manner occurred*

Falls to surface	59%
Falls to same equipment	11%
Falls to other equipment	2%
Falls - total	72%
Impact with moving equipment	7%
Contact with protrusions, pinch points, sharp edges and sharp points	5%
Falls against stationary equipment	8%
Unknown	8%
Total	100%

*Source: NEISS emergency room special study, April 10, 1978 - May 1, 1978

Table 2 compares the percentage of injuries related to particular types of equipment with the percentage of equipment in use.

TABLE 2

Injuries related to equipment use*

	INJURIES	EQUIPMENT IN USE
Climbers	42%	51%
Swings	23%	20%
Slides	16%	12%
Merry-go-rounds	8%	5%
Seesaws	5%	6%
All other	6%	6%
Total	100%	100%

*Source: NEISS Emergency room special study, April 10, 1978 - May 1, 1978

Two separate actions intended to result in mandatory standards for playground equipment were initiated in 1972. First, the United States Food and Drug Administrations' (FDA) Bureau of Product Safety (BPS) issued a report, Public Playground Equipment (B.P.S., 1972) revealing a dismal picture of playground hazards and injuries in the United States. Playground equipment was ranked eighth on the Consumer Product Safety list. Second, the Food and Drug Administration requested that the Consumer Product Safety Commission (CPSC) support a study of public playground equipment by the University of Iowa. The Iowa investigators (McConnell et al., 1973) explored accident injury data prepared by the National Electronic Injury Survey System, the National Safety Council and in-depth studies by the CPSC. They also utilized anthropometric data (ages of children and sizes of equipment) and data on behaviors of children (equipment misuse, horseplay) which contribute to accidents and injuries. This report influenced studies on

anthropometric data and strength of children by the University of Michigan, and studies of playground surfaces by the Franklin Testing Institute.

The scientific tests of playground surfaces were to be influential in subsequent efforts to develop safety standards. National Electronic Injury Survey System data consistently identifying falls onto hard surfaces (not equipment per se) as the chief incriminating factor in serious injuries and fatalities on public playgrounds. In sum, the test results were grouped as follows:

1. Extremely hazardous;
   - *concrete
   - *asphalt
   - *packed earth

2. Conditionally acceptable;
   - *gym mats (2 in.)
   - *double-thick gym mats
   - *rubber mats (1 1/8 in.)
   - *double thick rubber mats
   - *pea gravel
   - *wood chips
3. Acceptable;
   - *sand (8-10 in.)

School districts were reacting in various ways to fatalities and injuries resulting from falls onto hard surfaces. For example one large Southern city removed all the swings from its elementary schools because

too many children were being injured from falls onto the asphalt surfaces previously installed to reduce maintenance problems. Following the unfortunate death of a seven year old child in an elementary school playground, the Ogden, Utah School District ordered over 10,000 square feet of manufactured safety turf for installation under playground equipment and made plans to modify certain equipment to make it safer.

During the same period of the Iowa Study, the Playground Equipment Manufacturer's Association was working in conjunction with a safety task force of the National Recreation and Park Association to develop a set of proposed safety standards. Their draft, circulated by the Consumer Product Safety Commission (1973) was intended to be used by industry as a voluntary standard. In 1974, a member of this group, public school teacher Elayne Butwinick, petitioned the CPSC to exercise its authority under Section 7 of the Consumer Product Safety Act and began proceedings for consumer product safety standard for playground slides, swinging apparatus, and climbing equipment (Butwinick, 1974).

Butwinick critized the work of the CPSC Task Force . "... I find the standards are being drawn up by industry with only token input by other members. The Task Force has only met twice, once in April of 1973 and once in October of 1973." She also revealed that the preliminary draft was already influencing industry. "The voluntary standards, with some modifications are being used by at least one company, Game Time by Toro, as a means of advertising their equipment." Butwinick goes on to claim, both the Game Time and the industry voluntary standard are inadequate because: (1) heavy swinging objects are excluded from coverage; (2) slide sides are dangerously low; (3) the danger of specific surfaces is excluded; and (4) performance tests are not utilized.

Butwinick supported her petition with reports showing that playground equipment ranked 10th in frequency among product categories by hospital emergency reports; third in a physician's survey, and 12th in an insurance survey. She personally conducted three surveys involving accident reports of a recreation department (250 accident reports), and two area school systems, one having 3,425 accident reports in a single year with 656 involving playground apparatus, and the other having 419 playground apparatus accidents. The injuries included several fractured skulls, vaginal bleeding, a fractured shoulder blade, a near severed tongue, a crushed jawbone, kidney contusions, a fractured spine, teeth knocked out and severe lacerations. To further support her petition, Butwinick detailed several fatalities resulting from head injuries incurred in falls onto paved surfaces; a ten year old in Rock City, Illinois, a seven year old in Ogden, Utah, a nine year old in Milwaukee, and a six year old in Los Angeles. She noted that the death of the six year old in Los Angeles in 1951 was the eleventh playground death in that school system over a twenty year period. In 1955 the System installed rubber surfacing under playground equipment and as of 1965, ten years later, "had had no further fatalities."

Butwinick's surveys supported the findings of other investigators in identifying the most likely occurences leading to injuries and fatalities: falling onto hard surfaces (especially asphalt and concrete); being struck by heavy swing seats (weighing from 2 to 59 pounds); entrapment in poorly designed equipment and; pinch and crush points on equipment. She noted that 85 per cent of all accidents on climbing equipment involved falls. The fatalities she reported involving climbing equipment "<u>all occurred on asphalt or pavement</u>." She cited a nationwide spot check of school business officials revealing that "60 per cent of today's school districts have blacktop under

play equipment. . ."

Butwinick's petition was later endorsed by the Americans for Democratic Action and the Consumers Union. A second petition, submitted by Theodora Sweeney (1974), chairperson of Coventry School P.T.A. in Cleveland Heights, Ohio was used by the CPSC in support of the Butwinick petition. Later in 1974, that the Federal Hazardous Substance Act, rather than the Consumer Product Safety Act, was the appropriate legal mechanism for regulating playground equipment. The CPSC extended a call for proposals in the Federal Register to develop a standard to cover both home and public playground equipment. A contract was granted to the National Recreation and Park Association, the only bidder. A committee of citizens and representatives from industry formulated a report, Proposed Safety Standards for Playground Equipment (NRPA, 1976).

The NRPA report stimulated a great deal of controversy. Designers feared the standards would stifle creativity; industry was concerned that adoption would lead to high retooling expenses. The CPSC identified problems of ". . .inadequate technical rationale, validity, repeatability and reproductability of the test methods, and so forth, and the Commission contracted with the National Bureau of Standards (NBS) for the technical work needed to revise the recommended standard." (CPSC, 1979).

The NBS completed two reports (NBS, 1978a; 1978b) in 1978 and a third in 1979 (NBS, 1979). The CPSC sponsors of the NBS studies decided to issue the NBS reports as handbooks rather than as mandatory regulations. "The variety of users and equipment, the diverse ways in which the equipment may be used, and the many non-equipment factors involved in overall playground safety clearly indicate that a mandatory equipment specification by itself cannot adequately address the problem of playground injuries (CPSC,

1979)". However, before distributing the handbooks, the Commission decided to request comment on the NBS reports from the general public. The call for proposals for this purpose was published in the Federal Register on October 4, 1979.

The author of the present article responded to this call for proposals, conducted an analysis of the three NBS documents and submitted a report (Frost, 1980). It was found that the reports (and the handbooks published by the CPSC in 1981) did indeed reveal a great deal of useful information, yet they were not sufficiently refined to serve as a standard or as a handbook. Sections on testing equipment were too technical for many consumers; home playground equipment was excluded and; the most common playground surface, soil, was not subjected to impact testing. Perhaps the most serious fault was the general orientation to conventional, outmoded equipment. The illustrations represented bad design, unjustifiable expense and excessive hazards, such as heavy wood and animal-type swing seats, restricted areas between moving parts, protruding elements, and excessive heights. There were no drawings or photographs of well-designed contemporary play- structures. The illustrations were generally of outmoded, single or limited function equipment such as narrow slide and ladder combinations with limited access and entry to promote one-at-a-time and stand-in-line play activity.

Despite these shortcomings, it should be acknowledged that the NBS reports and the handbooks later published by the CPSC (1981a; 1981b), are probably the most extensive and thoughtful safety guidelines to date. They represent a substantial amount of research and technical expertise and compile many major essentials for playground and play equipment safety. The CPSC recommendations are summarized in three Playground Safety Checklists reprinted below.

Suggested Public Playground Planners' and Installers' Checklist

1. Separation of equipment for different age groups.
2. Placement of swing(s) or swing seats away from other activities or equipment.
3. Adequate space for children to exit equipment such as slides and merry-go-rounds.
4. Layout designed to promote a safe flow of traffic between areas.
5. Fencing or other barriers to separate the playground from adjacent streets.
6. Clearly marked "danger" zones (e.g., those areas covered by swinging seats from swing sets and areas in front of sliding boards).
7. No equipment installed over hard surfaces such as concrete or asphalt.
8. Accessible components of equipment adjacent to sliding surfaces shaped so that a child's clothing cannot be caught as the child uses the slides.
9. No component or group components forming angles or openings that could trap a child's head or any part of a child's body.
10. Protective barriers on surfaces which are elevated more than 30 inches from an underlying surface, assuring that the barriers do not create another hazard (i.e., horizontal cross pieces on which children can climb).

11. Handgripping components of size and shape to make them easy for a child to grasp.
12. Climbing and gripping surfaces which are slip resistant under both wet and dry conditions.
13. Explanation signs where needed, (e.g., in color coded areas.)

Inspections should be conducted on a frequent, regularly scheduled basis. Listed are some of the danger points that should be checked on each tour.

Suggested Public Playground Maintenance Checklist

Inspections should be conducted on a frequent, regularly scheduled basis. Listed are some of the danger points that should be checked on each tour:

1. Visible cracks, bending, warping, rusting, or breakage of any component.
2. Deformation of open hooks, shackles, rings, links, etc. Worn swing hangers and chains.
3. Missing, damaged, or loose swing seats; heavy seats with sharp edges or corners.
4. Broken supports/anchors.
5. Footings exposed, cracked, loose in ground.
6. Accessible sharp edges or points.
7. Exposed ends of tubing that should be covered by plugs or caps and covers.
8. Loose bolts, nuts, etc.

9. Splintered, cracked or otherwise deteriorated wood.
10. Lack of lubrication on moving parts.
11. Worn bearings.
12 Broken or missing rails, steps, rungs, seats.
13. Surfacing material worn or scattered (in landing pits, etc.).
14. Hard surfaces, especially under swings, slides, etc.
15. Chipped or peeling paint.
16. Vandalism (broken glass, trash, etc.)
17. Pinch or crush points, exposed mechanisms, junctures of moving components (e.g., axis of seesaw).
18. Tripping hazards such as roots, rocks or other environmental obstacles.
19. Poor drainage areas.

Suggested Public Playground Leader's Checklist

1. Prepare written guidelines for playground operation, defining goals and procedures.
2. Insist on first aid and accident training for playground leaders.
3. Provide for constant supervision by establishing a written code.
4. Instruct children and playground supervisors on how to use equipment (Playground equipment safety should be taught in the classroom.)
5. Conduct daily cleaning and check for broken glass and other litter.

6. Do not permit children to use wet or damaged equipment.
7. Do not permit too many children on the same piece of equipment at the same time; suggest that children take turns, or direct their attention toward other equipment or activities.
8. Constantly observe play patterns to note possible hazards and suggest appropriate equipment or usage changes.
9. Make periodic checkups, and request that worn or damaged pieces of equipment be replaced.
10. Prepare written accident reports with special attention to surface conditions, type and extent of injury, age and sex of child, how the accident occurred, and weather conditions.

(Reprinted from: U.S. Consumer Product Safety Commission. A Handbook for Public Playground Safety: Volume I. Washington, D.C.: Superintendent of Documents, 1981.)

Conclusion

It is to the discredit and chagrin of contemporary school and public park officials that most American playgrounds, particularly public school playgrounds, still bear striking similarities to those of the early 1900's. The typical modern day playground, with minor exceptions (e.g., deletion of giant strides) is consistent with the National Recreation Association's 1929 guidelines. This is perhaps the single most striking indictment of the concern

of adults toward the value of children's play and the safety of their playgrounds. Equipment of traditional design such as swings, slides, seesaws, climbers and merry-go-rounds are the most common equipment in the United States.

Playground and play equipment designers, manufacturers and consumers have reacted very slowly to research data and expert opinion about playground safety: soft, flexible swing seats were proposed in 1908; special resilient surfaces under and around playground apparatus were recommended by a major committee of the National Recreation Association in 1932; regular inspection and repair of equipment was recommended by writers in the early 1900's; the causes of injuries and fatalities on playgrounds have been extensively documented by research and the National Electronic Injury Survey System since 1972 and; guidelines for playground safety have been developed in increasing frequency throughout the twentieth century. Despite such advances in knowledge most manufactured play equipment and, consequently, most playgrounds remain hazardous and unsuited to children's developmental play needs.

Fortunately, several professional organizations are now initiating research and development aimed at improving playground safety. In 1985, a small group of play specialists working under the sponsorship of the American Association for Leisure and Recreation and the International Playground Association, conducted a national survey of elementary school playgrounds. For the first time comprehensive national data on the state of children's playgrounds are available and will be reported at a special International Playground Association/USA Conference on safety in play at the University of Cincinnati in 1986. Also in 1986, the organization, Play and Learning in Adaptable Environments, Inc.,with the sponsorship of the

National Endowment for the Arts and other groups, will convene playground specialists at Stanford University to develop evaluation criteria and design guidelines for recreational equipment and play environments for children with and without disabilities. The resulting guidelines will be published by the Landscape Architectural Foundation and distributed through participating organizations.

In sum, several interrelated factors contribute to playground safety and must be considered in future deliberations. These are: (1) design of the total playground, including surfacing, (2) design ofequipment, (3) installation of equipment, (4) maintenance of the total playground and (5) use, including supervision and training. Finally, it must be acknowledged the cognitive/ motor skills of children are as important as the above factors in promoting playground safety. The poorly coordinated, inexperienced child with limited problem solving abilities is unsafe on any playground (Frost and Henniger, 1979). The challenge to adults responsible for playgrounds is to ensure that children have convenient access to safe, yet challenging playgrounds and that time and support for their use is assured.

Copyright,
Joe L. Frost
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